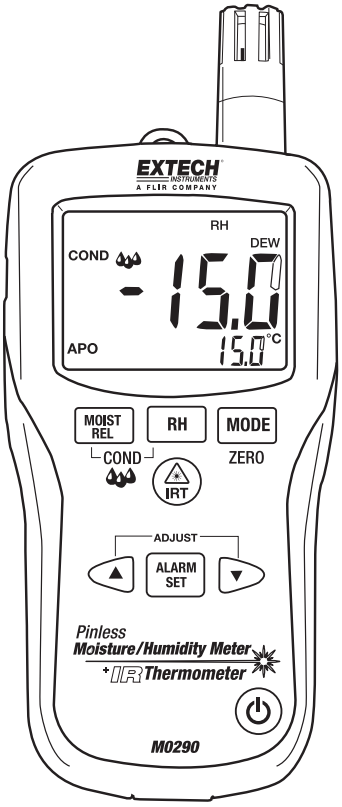
User's Guide

EXTECH INSTRUMENTS
A FLIR COMPANY

Pinless Moisture/Humidity Meter + IR

Model MO290

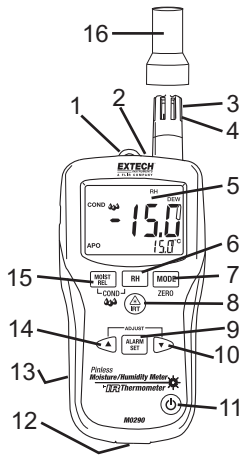


Introduction

Congratulations on your purchase of the Extech MO290 Pinless Moisture Meter with Patented Built-in IR Thermometer. Monitor moisture in wood and other building materials with no surface damage with the Pinless Moisture sensor (Pin-type Moisture Probe included). Measure Humidity and Air Temperature with built-in probe plus non-contact InfraRed Temperature with patented IR design. Advanced functions provide Grains per Pound, Dew Point and Vapor Pressure calculations. This meter is shipped fully tested and calibrated and, with proper use, will provide years of reliable service.

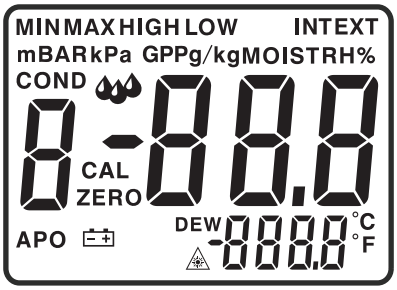
Meter Description

1. IR temperature sensor
2. Laser pointer
3. Humidity sensor
4. Temperature sensor
5. LCD display
6. Relative Humidity button
7. Mode/Zero Button
8. IR thermometer button
9. Alarm set button
10. Alarm adjust down button
11. ON/OFF power button
12. Remote pin probe input jack (bottom)
13. Battery compartment (rear)
14. Alarm adjust up button
15. Moisture/Relative button
16. Protective cap



LCD Display

1. MIN MAX – Minimum and maximum value
2. HIGH LOW – Alarm limits
3. INT EXT – Internal/External probe
4. mBar – Vapor pressure
5. kPa – Vapor pressure
6. GPP – Grains per Pound
7. g/kg – Grains per kilogram
8. MOIST – Moisture mode
9. RH% - Relative Humidity mode
10. COND – Condensation mode
11. APO – Auto power off
12. DEW – Dew Point temperature
13. C/F – Temperature units
14. [-+] - Low battery
15. [laser] - Laser pointer On



Safety

- Use extreme caution when the laser pointer beam is on
- Do not point the beam toward anyone's eye or allow the beam to strike the eye from a reflective surface
- Do not use the laser near explosive gases or in other potentially explosive areas

Features

- Quickly indicates the moisture content of materials with Pinless technology without damaging the surface;
- Optional remote Pin-type probe (MO290-P) allows for moisture readings at different penetration levels (3ft/0.9m cable length);
- Easy to read, large dual display with backlit feature;
- Simultaneously displays % moisture of wood or material being tested and Air Temperature, IR Temperature, or Humidity
- Designed with patented IR design to measure non-contact surface temperature; 8:1 distance to spot ratio with 0.95 fixed emissivity
- Built-in Humidity/Temperature probe measures Relative Humidity,
- Air Temperature plus Grains Per Pound (GPP) and Dew Point (DP)
- Automatic calculation of differential Temperature (IR - DP)
- Min/Max and Data Hold
- Auto power off and low battery indication

Battery Replacement

1. Turn off the meter.
2. Remove one Philips head screw and lift off the rear battery cover.
3. Replace the 9V battery.
4. Secure the rear battery cover.

Operation

Powering the meter

1. Remove the RH sensor protective cap before use.
2. Press the power ⏻ button to turn the meter on.
3. If the [-+] symbol appears or the meter does not turn on, replace the battery.

Humidity (Dew point, GPP, g/kg) Measurements

1. Press the power ⏻ button to turn the meter on.
2. Press the RH button
3. Relative Humidity will be displayed in the primary display and the temperature will be displayed in the secondary display.
4. Press the up or down arrow button to change the temperature units.
5. Press the MODE button to display the DEW point.
6. Press the MODE button to display GPP (°F) or g/kg (°C)

Pinless Moisture Measurements

1. Press the power ⏻ button to turn the meter on.
2. Press the MOIST button to select Moisture measurement." MOIST", and "INT" (internal pinless sensor) will appear in the display.
3. Hold the meter so that the rear sensor is away from any surface or your hand. The reading should be near 0.0. If not, press and hold the ZERO button for more than 2 second and the ZERO icon appears.
4. Place the rear sensor on the surface of the material to be tested and read the relative moisture content.

Pin Type Moisture Measurements

1. Connect the external pin probe to the jack on the bottom of the meter.
2. Press the power ⏻ button to turn the meter on.
3. Press the MOIST button twice to select Moisture measurement." MOIST", and "EXT" (external pin probe) will appear in the display.
4. Press the probe pins into the material and read the % moisture content in the display.

Infrared Temperature Measurements

1. Press the power ⏻ button to turn the meter on.
2. Press the IRT button to enable the IR thermometer and the laser pointer. The laser pointer icon will flash while the mode is active.
3. Press the up or down arrow button to change the temperature units
4. Aim the laser pointer at the surface to be measured and read the surface temperature in the secondary display.
5. Release the IRT button. The last temperature measured and the laser icon will remain on the display for approximately 10 seconds before returning to ambient temperature measurement.

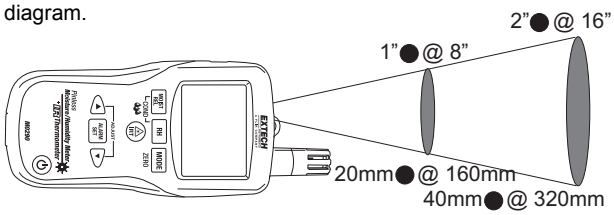
IRT MAX MIN display:

The meter can be set to display only the maximum or minimum temperature measured during an IR scan.

1. With the meter in the IR hold mode, press the MODE button. “MIN” will appear in the display.
2. Press the IRT button to enable the IR thermometer. The meter will display the minimum temperature measured and will update only when a lower temperature is measured.
3. Press the MODE button twice to enable the MAX mode and proceed as stated above for the maximum temperature.
4. The MAX or MIN temperature is not stored when the function is exited.

IR Field of View

Ensure that the desired target is larger than the spot size. As the distance from an object increases, the spot size of the area measured by the meter becomes larger. The meter’s field of view ratio is 8:1, meaning that if the meter is 8 inches (cm) from the target, the diameter (spot) of the object under test must be at least 1 inch (cm). Refer below to the field of view diagram.



WARNING: Do not directly view or direct the laser pointer at an eye. Low power visible lasers do not normally present a hazard, but may present some potential for hazard if viewed directly for extended periods of time.

Condensation Mode

The Condensation feature alerts the used when the surface temperature as measured by the IR thermometer is close to or has reached the Dew Point temperature.

1. Press the power ⏻ button to turn the meter on.
2. Simultaneously press the MOIST/REL and RH buttons. The “COND” icon will appear.
3. Point the meter at a surface, press the IRT button to measure the surface temperature. The small display will indicate the IR surface temperature and the large display will indicate the difference between the IR temperature and the Dew Point temperature.
4. The meter will then report the potential for condensation on that surface in the following manner
   - If the temperature of the IRT is more than 14°C (25°F) above the Dew Point, the temperature difference shall be displayed, with no other warning.
   - If the temperature of the IRT is 3-14°C (5-25°F) above the Dew Point, the temperature difference shall be displayed, along with a standard Condensation Indicator icon. The meter shall beep once to confirm that the reading is in the risk area.
   - If the temperature of the IRT is less than 3°C (5°F) above the Dew Point, the temperature difference shall be displayed, along with a flashing Condensation Indicator icon. The meter shall beep twice to confirm that the reading is in the high-risk area.
5. Press the RH button to exit the mode.

Vapor Pressure Mode

1. With the Condensation mode active, press the MODE button to display the Vapor Pressure in mBAR (°F) or kPa (°C).
2. Press the MODE button to exit the Vapor Pressure mode.

Alarm High and Low Limit Setting

High and Low alarm points can be set for Humidity and Moisture measurements.

Humidity Alarm Set Procedure:

1. With RH% displayed, simultaneously press the RH and MODE buttons.
2. The “HIGH” icon will appear on the display.
3. Press the ▲or ▼button to set the high limit desired.
4. Press the ALARM SET button to save the value and proceed to the LOW set value.
5. With the “LOW” icon in the display, Press the ▲or ▼button to set the low limit desired.
6. Press the ALARM SET button to save the value and to return to the normal mode.
7. If the humidity measurement is lower than the low alarm setting or higher than the high alarm setting, the meter will beep once every second.

Moisture Alarm Set Procedure:

1. With MOIST displayed, simultaneously press the MOIST/REL and MODE buttons.
2. The “HIGH” icon will appear on the display.
3. Press the ▲or ▼button to set the high limit desired.
4. Press the ALARM SET button to save the value and proceed to the LOW set value.
5. With the “LOW” icon in the display, Press the ▲or ▼button to set the low limit desired.
6. Press the ALARM SET button to save the value and to return to the normal mode..
7. If the moisture measurement is higher than the LOW alarm setting, the meter will beep once every second
8. If the moisture measurement is higher than the HIGH alarm setting, the meter will beep continuously.

Auto Power Off

The meter will enter a sleep mode after 30 minutes of inactivity. The meter will emit a warning beep 15 seconds before shutting down.

To disable the APO feature, press the MODE button when turning the meter ON. The “APO” icon will not appear, indicating it is disabled.

Specifications

Function	Range	Accuracy
Pinless Moisture	0 to 99.9	Relative only
Ext. Pin Moisture	0 to 99.9	Relative only
Pinless Depth	Up to 0.75” (19mm)	
RH Measurement	0 to 10%	± 3%RH
	11 to 90%	± 2.5%RH
	91 to 100%	± 3%RH
Air Temperature	-20 to 170°F (-29 to 77°C)	± 3.6°F (2.0°C)
IR Temp	-4 to 31°F	± 9°F
	32°F	± 2°F
	33 to 392°F	Greater of ±3.5% or ±9°F
	-20 to-1°C	± 4.5°C
	0°C	± 1°C
	1 to 200°C	Greater of ±3.5% or ± 4.5°C

Display	3-digit primary display, 4-digit secondary display
Vapor Pressure	0 to 20.0kPA
Dew Point	-22 to 199°F (-30 to 100°C)
Mixing Ratio	0-999GPP (0 to 160g/kg)
Sample Rate	2 per second
Backlight	White LED
Operating Temperature	40 to 110°F (4 to 43°C)
Storage Temperature	-14 to 140°F (-30 to 60°C)
Operating Humidity	90%, 32-86°F (0-30°C), 75%, 86-104°F (30-40°C), 45%, 104-122°F (40-50°C)
Storage Humidity	90%
Power Supply	9V battery
Battery Life	6-8 weeks (4 hrs/day use), using alkaline batteries
Auto Power Off (APO)	After 30 minutes (nominal) inactivity. The APO function can be disabled by the user.
APO Quiescent Current	50µA maximum
Dimensions	6.5x2.8x1.5’ (165x70x38mm)
Weight	7.4oz (210g)

Warranty

EXTECH INSTRUMENTS CORPORATION (A FLIR COMPANY) warrants this instrument to be free of defects in parts and workmanship for **one year** from date of shipment (a six month limited warranty applies to sensors and cables). If it should become necessary to return the instrument for service during or beyond the warranty period, contact the Customer Service Department at (781) 890-7440 ext. 210 for authorization or visit our website www.extech.com for contact information. A Return Authorization (RA) number must be issued before any product is returned to Extech. The sender is responsible for shipping charges, freight, insurance and proper packaging to prevent damage in transit. This warranty does not apply to defects resulting from action of the user such as misuse, improper wiring, operation outside of specification, improper maintenance or repair, or unauthorized modification. Extech specifically disclaims any implied warranties or merchantability or fitness for a specific purpose and will not be liable for any direct, indirect, incidental or consequential damages. Extech's total liability is limited to repair or replacement of the product. The warranty set forth above is inclusive and no other warranty, whether written or oral, is expressed or implied.

Calibration and Repair Services

Extech offers repair and calibration services for the products we sell. Extech also provides NIST certification for most products. Call the Customer Care Department for information on calibration services available for this product. Extech recommends that annual calibrations be performed to verify meter performance and accuracy.

Support line (781) 890-7440

Technical Support: Extension 200; E-mail: support@extech.com

Repair & Returns: Extension 210; E-mail: repair@extech.com

Product specifications subject to change without notice

For the latest version of this User Guide, Software updates, and other up-to-the-minute product information, visit our website: www.extech.com

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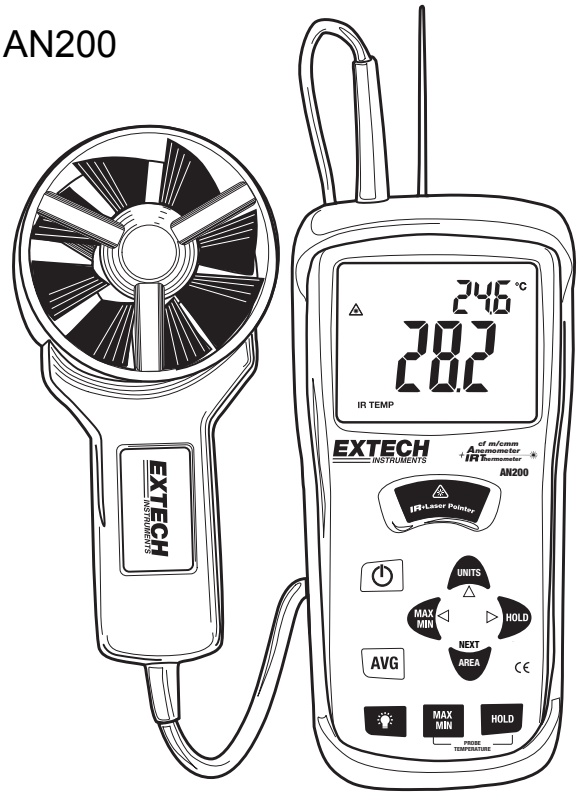
User's Manual

EXTECH INSTRUMENTS

A FLIR COMPANY

CFM/CMM Thermo Anemometer + InfraRed Thermometer

Model AN200



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Introduction

Congratulations on your purchase of the Extech AN200 CFM/CMM Thermo Anemometer with InfraRed Thermometer. This instrument measures Air Velocity, Air Flow (volume), Air Temperature (with probe) and Surface Temperature (with the InfraRed function). The large, easy-to-read backlit LCD includes primary and secondary displays plus numerous status indicators. The InfraRed feature includes a laser pointer for convenient targeting. In addition, the meter can store 16 area setting dimension for easy recall. Proper use of this meter will provide years of reliable service.

CAUTIONS

- Improper use of this meter can cause damage, shock, injury or death. Read and understand this user manual before operating the meter.
- Inspect the condition of the probe and the meter itself for any damage before operating the meter. Repair or replace any damage before use.
- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
- This device is not a toy and must not reach children's hands. It contains hazardous objects as well as small parts that the children could swallow. In case a child swallows any of them, please contact a physician immediately
- Do not leave batteries and packing material lying around unattended; they can be dangerous for children if they use them as toys
- In case the device is going to be unused for an extended period of time, remove the batteries to prevent them from draining
- Expired or damaged batteries can cause cauterization on contact with the skin. Always, therefore, use suitable hand gloves in such cases
- See that the batteries are not short-circuited. Do not throw batteries into the fire.
- **Do not directly view or direct the laser pointer at an eye.** Low power visible lasers do not normally present a hazard, but may present some potential for hazard if viewed directly for extended periods of time

Specifications

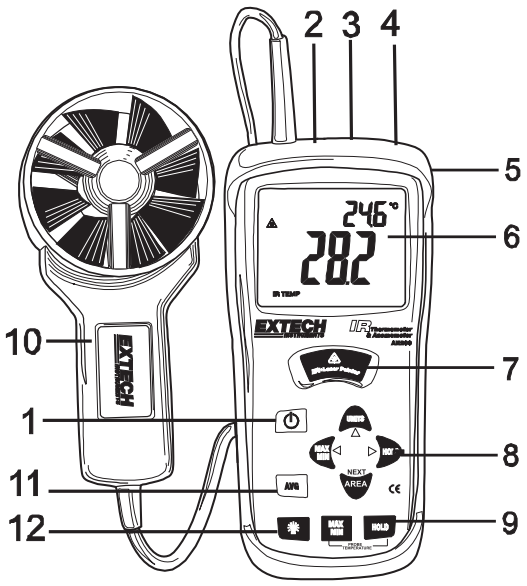
Air Velocity	**Range**	**Resolution**	**Accuracy**
m/s (meters per sec)	0.40 - 30.00 m/s	0.01 m/s	± (3%rdg + 0.20 m/s)
km/h (kilometers/hour)	1.4 - 108.0 km/h	0.1 km/h	± (3%rdg + 0.8 km/hr)
ft/min (feet per minute)	80 – 5900 ft/min	1 ft/min	± (3%rdg + 40 ft/m)
mph (miles per hour)	0.9 – 67.0 mph	0.1 mph	± (3%rdg + 0.4 MPH)
knots (nautical MPH)	0.8 to 58.0 knots	0.1 knots	± (3%rdg + 0.4 knots)
Air Flow	**Range**	**Resolution**	**Area**
CMM (cubic meters/min)	0-999999 m^3/min	.1	0 to 999.9m^2
CFM (cubic ft/min)	0-999999 ft^3/min	.1	0 to 999.9ft^2
Air Temperature	**Range**	**Resolution**	**Accuracy**
	14 - 140°F (-10 - 60°C)	0.1°F/C	4.0°F (2.0°C)
InfraRed Temperature	**Range**	**Resolution**	**Accuracy**
	-58 to -4°F (-50 to -20°C)	0.1°F/C	±9.0°F (5.0°C)
	-4 to 500°F (-20 to 260°C)	1°F/C	±2% reading or ±4°F (2°C) whichever is greater

Circuit	Custom LSI microprocessor circuit
Display	Dual function 0.5" (13 mm) 4-digit LCD
Sampling rate	1 reading per second approx.
Sensors	Air velocity/flow sensor: Conventional angled vane arms with low-friction ball bearing. Temperature sensors: NTC-type precision thermistor and InfraRed
IR Spectral response	6 to 14µm
IR Emissivity	0.95 fixed
IR distance ratio	8:1
IR sampling rate	2.5 readings per second approx.
Automatic Power off	Auto shut off after 20 minutes to preserve battery life
Operating Temperature	32°F to 122°F (0°C to 50°C)
Storage Temperature	14 to 140°F (-10 to 60°C)
Operating Humidity	<80% RH
Storage Humidity	<80% RH
Operating Altitude	2000 meters (7000ft) maximum
Battery	One 9 volt (NEDA 1604) battery
Battery life	80 hours approx. (if Backlight and Laser are used continuously the battery life is reduced to 2 to 3 hours approx.)
Battery current	8.3 mA DC approx.
Weight	1.6 lbs. (725g) including battery & probe
Dimensions	Main instrument: 7.0 x 2.9 x1.2" (178 x 74 x 33mm) Sensor Head: 2.75” (70mm) Diameter

Meter Description

1. Power ON/OFF button
2. Probe input jack
3. Laser pointer
4. IR Sensor
5. Rubber holster
6. LCD Display
7. IR thermometer measurement button
8. Airflow buttons (4)
9. Air Temperature function buttons (2)
10. Vane
11. Airflow Average button
12. Backlight button

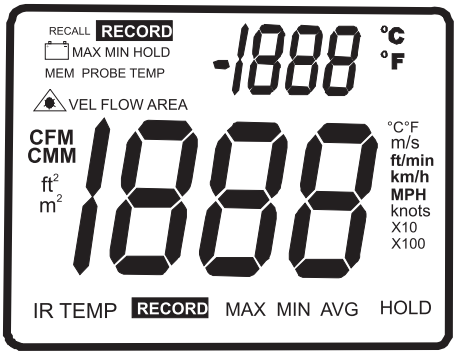
Note: The battery compartment, tilt stand and tripod mount are located on the rear of the instrument



Keypad

- Press to turn the meter ON or OFF
- **IR + Laser Pointer** Press and hold to measure.
- **MAX/MIN** Record and store the highest and lowest airflow or velocity readings.
  ◄ (LEFT) also serves as change decimal point button in AREA mode
- **UNITS** Press to select the mode of operation. In FLOW mode, the meter displays air *volume*. In VELOCITY mode, the meter displays air *speed*.
  ▲ (UP) also serves as increase number button in AREA mode.
- **HOLD** Press to freeze the displayed reading. Press again to unlock display.
  ►(RIGHT) also serves as change digit button in AREA mode.
- **AREA** Press and hold to manually enter the area of a duct in CFM or CMM mode.
  Press and hold to scroll thru memory locations.
  This button also clears memory in the Averaging mode.
- Press to turn the backlight on/off. Hold to disable Auto Power Off.
- **MAX/MIN (Temperature)** Press to record and store the highest, lowest readings for air temperature.
- **HOLD (Temperature)** Press to freeze the displayed temperature reading. Press again to unlock the display.
- **AVG** Press and hold to enter averaging mode. Averages up to 20 readings.

Display Layout



- **MAX** (top of LCD): Max Hold function engaged for the Air Temperature function
- **HOLD** (top of LCD): Data Hold function engaged for the Air Temperature function
- **PROBE TEMP**: Reminder that the top LCD digits represent Air (Vane) Temperature
- : Indicates that the laser pointer is on.
- **IR TEMP**: Indicates that the larger LCD digits represent IR temperature measurement
- **VEL**: indicates that meter is in air velocity mode
- **FLOW**: indicates that meter is in air flow mode
- **MAX** (bottom of LCD): Max Hold for the IR Temperature and RH function
- **HOLD** (bottom of LCD): Data Hold for the IR Temperature function and RH function
- **°C / °F**: Temperature units of measure
- **CFM/CMM**: airflow units of measure
- **Ft², m²**: units for area dimensions
- **m/s, ft/min, km/h, MPH, knots:** air velocity units of measure
- **X10, X100:** multipliers for air flow readings
- **AVG:** air averaging mode
- **RECORD:** indicates that min/max function is running (top for temp, bottom for air)
- Large LCD digits at center of display for Relative Humidity and IR Temperature
- Smaller LCD digits at top, right of display for Probe Temperature
- Low battery indicator

Operation

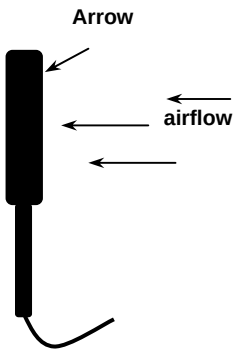
Connecting the Vane

1. The vane plug is inserted in the meter's sensor jack at the top of the meter. The plug and jack are keyed so that the plug can only fit in the jack one way.
2. Turn the plug carefully until it lines up with the jack and then firmly push the plug in place. Do not apply undue force or try to twist the plug side-to-side.
3. If the vane is not connected to the meter or if the sensor is defective, the LCD display will indicate dashed lines in place of an air velocity reading.

Air Velocity Measurements

1. Turn on the meter using the ⏻ ON/OFF button.
2. Press **UNITS** button to select the desired unit of measure. **NOTE:** At power up the meter will display the last unit of measure previously entered.
3. Place the sensor in the air stream. Ensure that the air enters the vane as indicated by the arrow sticker placed inside the vane. Refer to the diagram.
4. View the air velocity and temperature readings on the LCD Display. The large main LCD display shows the Air Velocity reading. The upper right LCD sub-display shows the temperature reading.

Side view of Vane



Air Velocity Measurements (Up to 20 Point averaging)

1. To enter 20 Point Averaging Mode, press and hold the **AVG** button until it beeps twice. The **AVG** icon will be displayed.
2. Take a measurement and press the **AVG** button. A single beep will sound and the **HOLD** icon will appear in the display.
3. The average reading will be displayed and number of readings measured will appear in the upper right hand corner of the display. After 5 seconds, the display will return to the current reading. (IMPORTANT: Please note that the average readings are only held for 5 seconds and cannot be recalled.)
4. Repeat steps 2 - 3 until all desired points have been measured.
5. Press the **AREA** button to clear the multipoint averaging memory.
6. To return to standard velocity measuring mode press and hold **AVG** button until meter beeps twice.

Note: In AVG mode, press and hold the **AVG** button until the meter beeps twice to return to normal operation.

Air Flow Measurements (CMM / CFM)

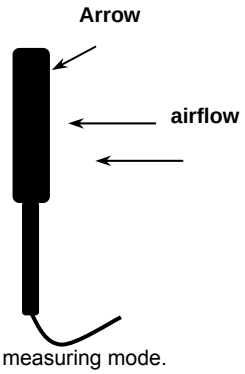
1. Turn on the meter using the ⏻ ON/OFF button
2. Press the **UNITS** button to select the desired air flow units: CMM (cubic meters per minute) or CFM (cubic feet per minute). **NOTE:** At power up the meter will display the last unit of measure previously entered.
3. To begin entering the area in m^2 or ft^2, press and hold the **AREA** button until it beeps twice. The leftmost digit of the bottom display will begin to flash.
4. Use the ▲ (UP) button to change the flashing digit

   Use the ◄ (LEFT) button to move the decimal

   Use ► (RIGHT) button to select the other digits.

   After all of the digits are entered, press and hold the **AREA** button (until meter beeps twice) to save the area into memory and return to CFM or CMM measuring mode.

Side view of Vane



5. Place the sensor in the air stream. Ensure that the air enters the vane as indicated by the arrow sticker placed inside the vane. Refer to the diagram.

The meter has 16 memory locations (8 for CFM and 8 for CMM) that can be used to storel commonly used area sizes that you can recall at anytime.

1. Press the **AREA** button until meter beeps twice. A memory location number will appear in the top right of the display indicating the memory location.
2. Push the **AREA** button to scroll thru and select the desired location. Once you have selected the desired memory location enter your dimension

   Use the ▲ (UP) button to change the flashing digit

   Use the ◄ (LEFT) button to move the decimal

   Use ► (RIGHT) button to select the other digits. After all of the digits are entered, press and hold the **AREA** button (until it beeps twice) to save the area into memory and return to CFM or CMM measuring mode.

To select and use a previously stored dimension, press and hold the **AREA** button until it beeps twice.

Press **AREA** to scroll thru the 8 memory locations. Press and hold the **AREA** button until it beeps twice. to return to CFM or CMM measuring mode.

Air Flow Measurements (Up to 20 Point averaging)

1. To enter 20 Point Averaging Mode, press and hold the **AVG** button until it beeps twice. The **AVG** icon will be displayed.
2. Take a measurement and press the **AVG** button. A single beep will sound and the **HOLD** icon will appear in the display.
3. The average reading will be displayed and number of readings measured will appear in the upper right hand corner of the display. After 5 seconds, the display will return to the current reading. (IMPORTANT: Please note that the average readings are only held for 5 seconds and cannot be recalled.)
4. Repeat steps 2 - 3 until all desired points have been measured.
5. Press the **AREA** button to clear the multipoint averaging memory.
6. To return to standard airflow measuring mode press and hold **AVG** button until meter beeps twice.

Data Hold (Air Velocity/Air Flow)

1. While taking measurements, press the **HOLD** button to freeze the air velocity/air flow reading for later viewing.
2. The **HOLD** indicator will appear in the bottom of the LCD display.
3. Press **HOLD** again to return to normal operation.

MAX/MIN/AVG Record (Air Velocity/Air Flow)

This allows the user to record and view the highest (MAX), lowest (MIN) and average (AVG) readings.

1. Press the button **MAX/MIN** button. The **AVG** indicator and **RECORD** indicator along with the average reading will appear on the LCD display and the meter will begin keeping track of the MAX, MIN and Average values.
2. Press the **MAX/MIN** button again. The **MAX** indicator will appear on the display and display the Max reading.
3. Press the **MAX/MIN** button again to view the minimum reading. The **MIN** indicator along with the minimum reading will appear on the LCD display and display the Min reading.
4. Press the **MAX/MIN** button again to display current readings. **NOTE:** the meter will keep recording MAX/MIN/AVG readings.
5. To clear and stop MAX/MIN/AVG recording and return to normal operation, press the **AREA** button once when displaying the current reading.

Temperature Units

1. Remove the meter's rubber protective jacket and select the desired temperature units using the °F/°C slide switch located in the battery compartment.
2. Replace the protective jacket and connect the sensor to the sensor input jack on top of the meter.

Data Hold (Air Temperature)

1. While taking measurements, press the **PROBE TEMPERATURE HOLD** button to freeze the air temperature reading.
2. The HOLD indicator will appear in the bottom of the LCD display.
3. Press **PROBE TEMPERATURE HOLD** again to return to normal operation.

Max/Min Record (Air Temperature)

This allows the user to record and view the highest (MAX), lowest (MIN) air temperature readings.

1. Press the TEMPERATURE MAX/MIN button once. The **MAX** indicator will appear on the display and the meter will begin keeping track of the MAX/MIN air temperature values.
2. Press the button again to view the minimum reading. The **MIN** indicator along with the minimum air temperature reading will appear on the LCD display.
3. Press the button again to return to normal operation.

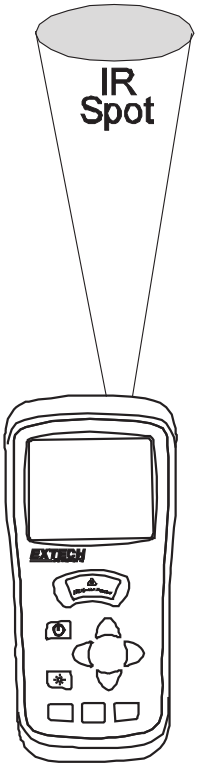
Automatic Power OFF

To conserve battery life, the meter automatically turns off after 20 minutes. To override this feature:

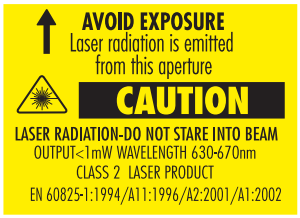
1. Turn the meter OFF.
2. Press and hold the ☼ (Backlight) key while turning the meter ON.
3. "dis APO" will appear in the display. The AUTO POWER OFF feature will now be disabled.
4. Note that AUTO POWER OFF is re-enabled each time the meter is turned on.
5. Also note that AUTO POWER OFF is disabled in CFM/CMM or Average mode.

InfraRed (Non-Contact) Temperature Measurements

1. The IR sensor is located at the top of the meter.
2. Point the sensor toward the surface to be measured.
3. Press and hold the red **IR** button to begin measuring the surface temperature of a desired target. IR TEMP and ⚠ will appear on the display. The laser pointer will switch on to help aim the meter.
4. The measured IR surface temperature will appear at the center of the LCD (larger digits). The temperature displayed is the temperature of the area within the spot.
5. When the red IR button is released, the laser pointer will switch off and the reading will freeze (data hold) on the display for approximately 3 seconds.
6. Note that the vane (Air Temperature) continues to monitor temperature during IR tests and its temperature is displayed on the top of the LCD (smaller digits).
7. After approximately 3 seconds the meter defaults to the Air Flow and Air Temperature display.



WARNING: Do not directly view or direct the laser pointer at an eye. Low power visible lasers do not normally present a hazard, but may present some potential for hazard if viewed directly for extended periods of time.



Battery Replacement

When appears on the LCD, the 9V battery must be replaced.

1. Disconnect the vane.
2. Remove the meter's rubber protective jacket
3. Use a flat blade screwdriver or a coin to open the rear battery compartment
4. Replace the 9V battery
5. Close the battery compartment and replace the meter's protective jacket

You, as the end user, are legally bound (**Battery ordinance**) to return all used batteries and accumulators; **disposal in the household garbage is prohibited!**

You can hand over your used batteries / accumulators, gratuitously, at the collection points for our branches in your community or wherever batteries / accumulators are sold!

Disposal

Follow the valid legal stipulations in respect of the disposal of the device at the end of its lifecycle

InfraRed Measurement Considerations

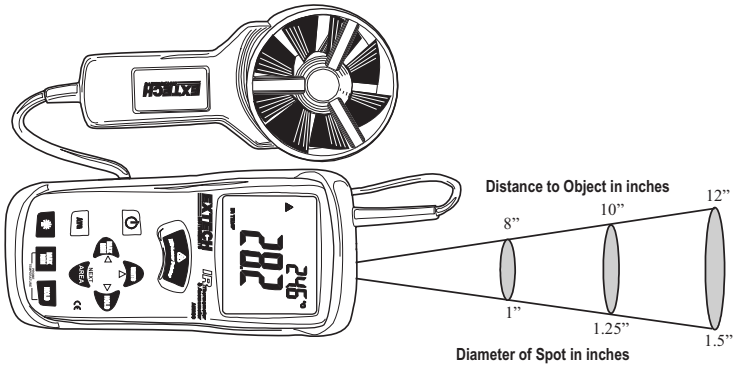
- When taking IR measurements the meter automatically compensates for ambient temperature changes. Note that it may take up to 30 minutes to adjust to extremely wide ambient changes.
- Low temperature measurements quickly followed by high temperature measurements may require several minutes to stabilize as a result of the IR sensor cooling process.
- If the surface of the object under test is covered with frost, oil, grime, etc., clean before taking measurements.
- If an object's surface is highly reflective apply masking tape or flat black paint before measuring.
- Steam, dust, smoke, etc. can obstruct measurements.
- To find a hot spot, aim the meter outside the area of interest then scan across (in an up and down motion) until the hot spot is located.

IR Theory

IR thermometers measure the surface temperature of an object. The meter's optics sense emitted, reflected, & transmitted energy that is collected and focused onto the meter's detector. The meter's circuitry translates this information into an LCD reading.

IR Field of View

Ensure that the desired target is larger than the spot size as shown in the diagram below. As the distance from an object increases, the spot size of the area measured by the meter becomes larger. The meter's field of view ratio is 8:1, meaning that if the meter is 8 inches from the target, the diameter (spot) of the object under test must be at least 1 inch. Other distances are shown below in the field of view diagram.



Emissivity

Most organic materials and painted or oxidized surfaces have an emissivity of 0.95. Inaccurate readings will result when measuring shiny or polished surfaces. To compensate, cover the surface under test with masking tape or flat black paint. Allow time for the tape to reach the same temperature as the material underneath then measure the temperature of the tape or the painted surface.

Thermal Emissivity Table for Common Materials

Material	Emissivity
Asphalt	0.90 to 0.98
Concrete	0.94
Cement	0.96
Sand	0.90
Earth	0.92 to 0.96
Water	0.67
Ice	0.96 to 0.98
Snow	0.83
Glass	0.85 to 1.00
Ceramic	0.90 to 0.94
Marble	0.94
Plaster	0.80 to 0.90
Mortar	0.89 to 0.91
Brick	0.93 to 0.96

Cloth (black)	0.98
Human skin	0.98
Leather	0.75 to 0.80
Charcoal (powder)	0.96
Lacquer	0.80 to 0.95
Lacquer (matt)	0.97
Rubber (black)	0.94
Plastic	0.85 to 0.95
Timber	0.90
Paper	0.70 to 0.94
Chromium oxides	0.81
Copper Oxides	0.78
Iron Oxides	0.78 to 0.82
Textiles	0.90

Useful Equations and Conversions

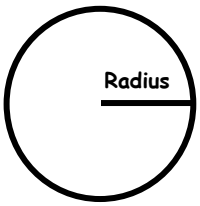
Area equation for rectangular or square ducts

Height (H)

Width (W)

Area (A) = Width (W) x Height (H)

Area equation for circular ducts



Area (A) = ⑥ x r^2
Where ⑥ = 3.14 and r^2 = radius x radius

Cubic equations

CFM (ft^3/min) = Air Velocity (ft/min) x Area (ft^2)
CMM (m^3/min) = Air Velocity (m/sec) x Area (m^2) x 60

NOTE: Measurements made in *inches*
must be converted to *feet* or *meters* before using the above formulae.

Unit of Measure Conversion Table

	m/s	ft/min	knots	km/h	MPH
1 m/s	1	196.87	1.944	3.6	2.24
1 ft/min	0.00508	1	0.00987	0.01829	0.01138
1 knot	0.5144	101.27	1	1.8519	1.1523
1 km/h	0.2778	54.69	0.54	1	0.6222
1 MPH	0.4464	87.89	0.8679	1.6071	1

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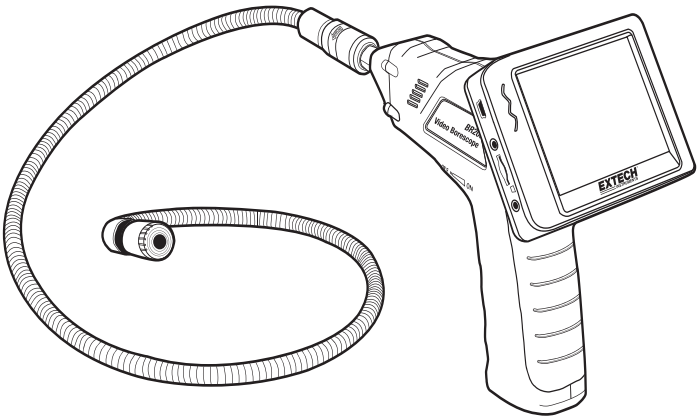
User's Guide

EXTECH®
INSTRUMENTS
A FLIR COMPANY

Video Borescope

Models BR200 and BR250



Introduction

Congratulations on your purchase of this Extech BR200 (17mm camera head) or BR250 (9mm camera head) Video Borescope. This instrument was designed for use as a remote inspection device. It can be used to peer into tight spots and then supply real-time video and images that can be recorded. Typical applications include HVAC inspection, automotive inspection, cable routing, and automotive/boat/aircraft inspection. This meter is shipped fully tested and, with proper use, will provide years of reliable service.

Features

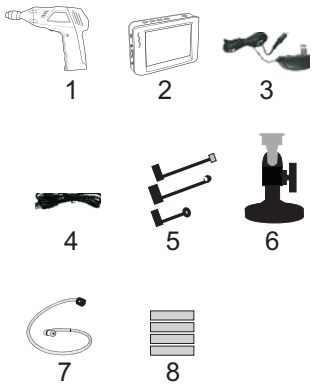
- 3.5 " TFT-LCD palm LCD monitor with high resolution
- The image head and the cable are water resistant when the unit is fully assembled (the monitor and the camera are not water resistant)
- Wireless and hard-wired functionality
- The monitor records video and images
- SD card capacity: 16G

Safety

- Do not expose instrument to moisture
- Shut off the instrument when not in use
- Remove the batteries when cleaning the instrument
- Replace all batteries at the same time

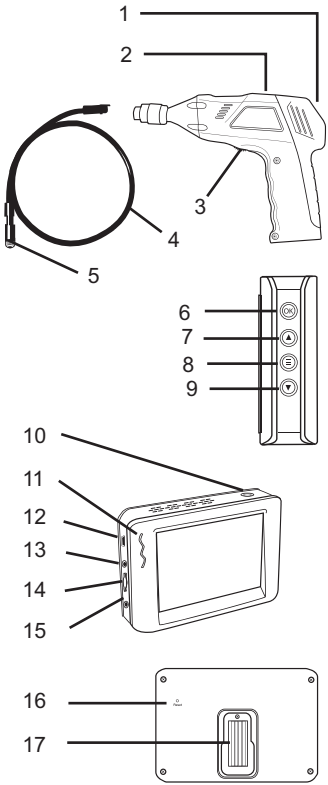
Supplied Equipment

1. Camera
2. LCD Monitor
3. Monitor Adaptor
4. Adaptor cable
5. Accessory Magnet / Hook / Mirror
6. Magnetic mount
7. Flex cable and camera head
8. 4 AA Batteries



Description

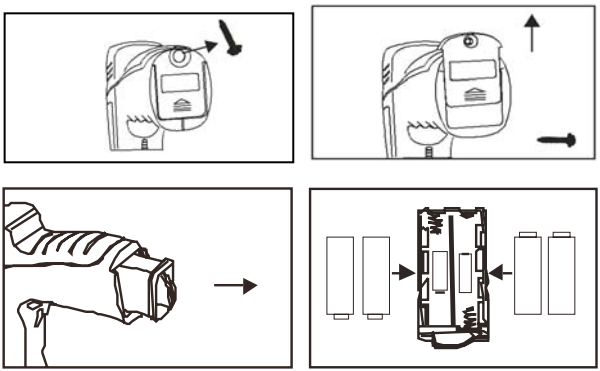
1 Signal output
2 Power Indicator
3 Power On/Off, Dimmer
4 Flexible tube
5 Camera head and LED's
6 OK
7 Up, video or jpg
8 Menu
9 Down. Channel select (4)
10 Power On/Off
11 Power Indicator
12 USB Socket
13 Video output
14 SD card socket
15 Power supply socket
16 Reset
17 Signal input



Installation

Install the batteries into the instrument body, charge the monitor battery, connect the camera and flexible tube to the body, insert the micro SD card. Install any accessory as needed.

Battery Installation

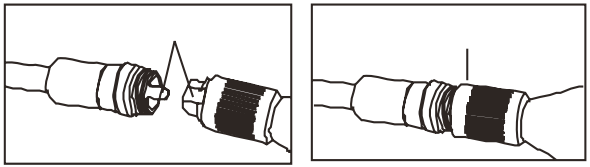


Connect Monitor Power

The monitor has a rechargeable battery. Plug in the AC adaptor and connect the cable to the *DC5V* socket on the monitor. The power indicator will light in red (or the battery capacity icon on LCD of monitor will blink, indicating that it is charging - and will turn off after a full charge)

Connect the camera and flexible tube

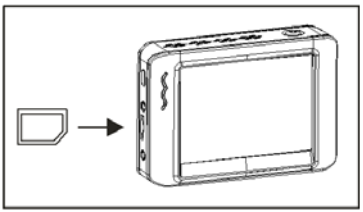
Connect the camera tube to the instrument body; ensure that the keyed ends are properly aligned. Once aligned, tighten the knurled knob to hold the connection firmly in place.



Warning. Permanent damage to the flex tube and loss of operation will occur if the flex tube is subjected to narrow radius or sharp angle bends.

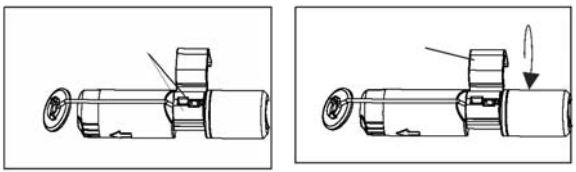
Inserting the micro SD card

Insert card with arrow pointing toward slot. Gently apply pressure until card locks into the spring loaded slot. To remove from unit, gently push the card inward and then release to eject it from the card slot.



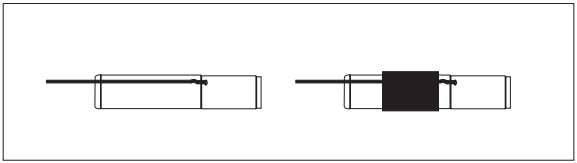
Installing the accessory tools （BR200）

The included accessories (mirror, hook and magnet) all attach to the camera in the same manner. Refer to the diagrams below:

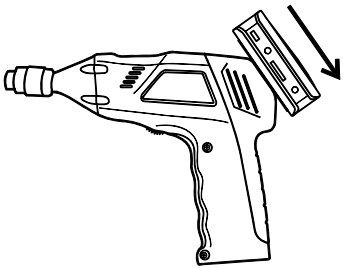


Installing the accessory tools （BR250）

Hook the attachment into the hole in the head and then slide the rubber sleeve over the attachment shaft



Attaching the Monitor to the instrument body



Connect the USB Cable

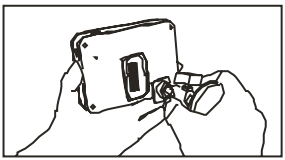
Use the USB cable to connect the monitor to a PC. The USB online icon will appear on the PC. Open **My Computer** on the PC, and locate the **Mobile Disk. The Mobile disk** can be used and accessed in the same manner as any external hard drive.

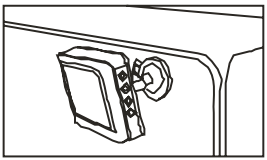
Video Output

Insert the video cable into the VIDEO OUT socket on the monitor. Insert the other end of the cable into the VIDEO IN jack of a TV or other monitor. The LCD Monitor will output a high quality video image.

Installing the Magnetic bracket

The magnetic bracket slides onto the rear of the monitor for convenient placement and viewing.





Operation

Basic Operation

1. Turn the ON/OFF dial switch to power the camera. The power indicator will switch on. The switch then acts as a dimmer for the two LEDs on the imager head of the camera.
2. Press and hold the monitor power switch for at least 2 seconds and the power indicator will illuminate green and a *Welcome* screen will appear.
3. Before attaching the monitor to the instrument body, press the down arrow button to select channel 4. The real time image will appear on the display LCD monitor.

   Note. If the picture does not properly syncronize or has poor color, check that the Video System Settings are set to “NTSC”, not to ‘PAL” . This should fix the condition..

4. Use the up arrow to select video or photo mode.
5. Turn the ON/OFF dial to adjust the LED light intensity as desired.
6. The tube can be easily maneuvered into position. The tube can be bent into the shape of the area to be examined.
7. Use the supplied accessories to help retrieve small items.

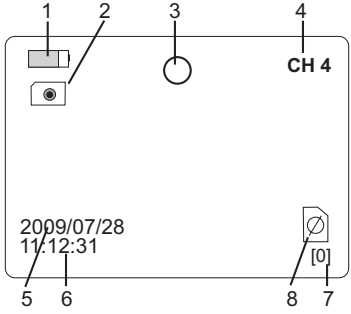
Taking a Picture

In Photo mode, press OK to take a picture. The photo will automatically save to the SD card.

Recording a Video

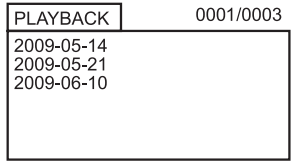
In Real-Time Monitoring (video) mode, press OK to begin recording; refer to the following diagram for display icon definitions:

1. Battery capacity
2. Function icon (video/photo)
3. Recording in progress
4. Channel
5. Date
6. Time Stamp
7. REC Time remaining
8. SD card



Viewing a Photo or Video

1. In the Real-Time Monitoring mode, press ☰ to display a list of dated playback folders
2. Use the ▼▲keys to select the desired folder.
3. Press OK to open the selected folder and view a list of photo or video files.



4. Files are listed by time followed by (**VID"**) for photos or (**VID**) for videos
5. Use the ▼▲keys to select a file.
6. Press OK to display the selected photo or video.

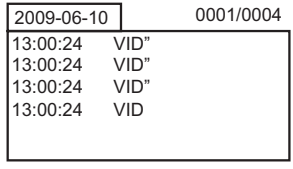
   For video files:

   Press OK to pause while playing.
   Press again to resume.

   ▲ Fast Forwards the video

   ▼ Rewinds the video

   Press ☰ to stop video

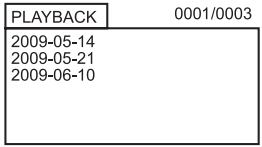


7. Press ☰ to return to menu.
8. Press ☰ again to exit.

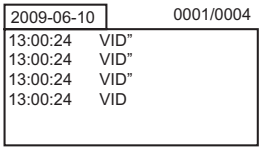
Note: Video automatically saves to file every 30 minutes. When the SD card is filled to capacity, the SD card icon changes to 'F'. No video will be recorded if the SD card is not inserted in the slot.

Delete a Single Video Or Photo

1. In the Real-Time Monitoring mode, press ☰ to display a list of dated playback folders
2. Use the ▼▲keys to select the desired folder.
3. Press OK to open the selected folder and view a list of photo or video files.



4. Files are listed by time followed by (**VID"**) for photos or (**VID**) for videos
5. Use the ▼▲keys to select a file.
6. Press and HOLD the ☰ button, the display will show '**DELETE CURRENT FILE?**'
7. Use the arrow keys to select **YES** or **NO**
8. Press OK to accept selection.
9. Press ☰ twice to exit the Delete screen.



Delete a File Folder

To delete a folder, use the same instructions for deleting a single video or photo. The only additional concern is that if a folder is not empty it cannot be deleted. Delete all of the files in a folder before deleting the folder. If the user attempts to delete a folder that is not empty, the following message will appear: FOLDER NOT EMPTY

Video Display on a PC

Several methods are available to playback or to copy video files on a PC. When connected, the files will become available as new drives on the PC.

1. SD card adaptor: Insert the mini SD card into the SD adaptor and then insert the adaptor into the PC SD slot (if available)
2. USB adaptor: Insert the mini SD card into a USB adaptor and plug into a USB port.

3. USB cable. Connect the USB cable from the camera to the PC.

Settings Mode

Press and hold ⊜ for two seconds to enter the Settings Mode.

Language Settings

1. In Settings Mode, use the arrow keys to select SYSTEM SETTING (green icon).
2. Press OK to call up the SYSTEM icon list
3. Use the arrow keys to highlight the Language icon (globe)
4. Press OK and the Language icon list will appear (flags)
5. Use the arrow keys to highlight the desired language
6. Press OK to select the highlighted language and exit

Video System Settings

1. In Settings Mode, use the arrow keys to select SYSTEM SETTING (green icon).
2. Press OK to call up the SYSTEM icon list
3. Use the arrow keys to highlight the Video System icon (yellow)
4. Press OK and the Video format selections will appear (NTSC, PAL)
5. Use the arrow keys to highlight NTSC
6. Press OK to select the highlighted format and exit

Format and Erase Media

1. In Settings Mode, use the arrow keys to select SYSTEM SETTING (green icon).
2. Press OK to call up the SYSTEM icon list
3. Use the arrow keys to highlight the FORMAT icon (blue)
4. Press OK and the FORMAT selection screen will appear (YES, NO)
5. Use the arrow keys to highlight the desired response
6. Press OK to accept the selection and exit

Restoring Factory Default Settings

1. In Settings Mode, use the arrow keys to select SYSTEM SETTING (green icon).
2. Press OK to call up the SYSTEM icon list
3. Use the arrow keys to highlight the DEFAULT icon (red)
4. Press OK and the DEFAULT selection screen will appear (YES, NO)
5. Use the arrow keys to highlight the desired response
6. Press OK to accept the selection and exit

View Version

1. In Settings Mode, use the arrow keys to select SYSTEM SETTING (green icon).
2. Press OK to call up the SYSTEM icon list
3. Use the arrow keys to highlight the VERSION icon (green)
4. Press OK to view the version
5. Press OK again to exit

Frame Rate Setting

1. In Settings Mode, use the arrow keys to select RECORDER SETTING (red icon).
2. Press OK to call up the RECORDER options
3. Use the arrow keys to highlight the FPS (frames per second) icon
4. Press OK to open the FPS parameter
5. Use the arrows to select the frame rate: 10, 15, 20, 25, or 30
6. Press OK to confirm

Time Stamp ON OFF Setting

1. In Settings Mode, use the arrow keys to select RECORDER SETTING (red icon).
2. Press OK to call up the RECORDER options
3. Use the arrow keys to highlight the Time Stamp icon (purple)
4. Press OK to open the parameter
5. Use the arrows to select ON or OFF
6. Press OK to confirm

Date/Time Setting

1. In Settings Mode, use the arrow keys to select DATE-TIME SETTING (yellow icon).
2. Press OK to call up Date and Time Settings window
3. Use OK to tab through the fields
4. Use the arrow keys to change a field setting
5. Press the ⊜ button to exit

Battery Replacement

You, as the end user, are legally bound (**EU Battery ordinance**) to return all used batteries, **disposal in the household garbage is prohibited!** You can hand over your used batteries / accumulators at collection points in your community or wherever batteries / accumulators are sold!

Disposal: Follow the valid legal stipulations in respect of the disposal of the device at the end of its lifecycle

Troubleshooting:

Power Reset for the LCD Unit

In the event of a power failure in the BR200/250 LCD display unit, follow the steps below to perform a power reset:

1. Un-dock the LCD module from the BR200/250 pistol-grip base unit.
2. Connect the AC adapter to the LCD module and the appropriate AC power source.
3. Locate the Reset port on the reverse side of the LCD module (labeled *Reset*).
4. Momentarily press the Power Reset button for at least 2 seconds and then release.
5. Leaving the AC adapter connected to the LCD module, power the unit on.
6. If the unit powers on, allow it to fully re-charge (up to 2 hours) before removing the AC adapter. If the LCD unit does not power on, repeat steps 1 through 6.

Specifications

CAMERA

Imaging Sensor	CMOS
Total Pixels (NTSC)	BR200: 712 x 486; BR250: 640 x 480
Horizontal View Angle	BR200: 50 degrees BR250: 45 degrees
Transmission Frequency	2468MHz
Focus point	BR200: 20cm (8”), BR250: 10cm (4”)
Minimum Illumination	0 Lux
Modulation Type	FM
Bandwidth	18MHz
Power Supply	4 x AA batteries
Unobstructed Effective Range	10m
Waterproof Capacity	IP67 (imager head only)
Dimensions (W D H)	186 x 145 x 41(mm) (Exclude Flexible Tube)

Weight (approx)	BR200: 530g BR250: 450g
Camera head Diameter	BR200: 17mm (0.67”) BR250: 9mm (0.36”)
Operating Temperature	-10°C~+50°C +14°F~+122°F

MONITOR

LCD Screen Type	3.5” TFT-LCD
Effective Pixels	320 (R.G.B.) x 240
Video System	PAL/NTSC
Transmission Frequency	2414, 2432, 2450, 2468MHz
Exterior Supply Voltage	5VDC
Consumption Current (Max.)	500mA
Charge Time	3 hours
Work Time	2 hours
Video Output Level	0.9-1.3VP-P@75Ω
Receiving Sensitivity	≤-85dBm
Dimensions (W x D x H)	100 x 70 x 25(mm)
Weight (Approx)	140g
Operating Temperature	-10°C~+50°C +14°F~+122°F
Operating Humidity (Max.)	15~85%RH

FCC Information

This device complies with part 15 of the FCC rules.
BR250/200: FCC-ID TW5GB8802-GB8803

Operation is subject to the following two conditions:

1. This device may not cause harmful interference
2. This device must accept any interference received, including interference that may cause undesired operation.

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